ORIGINAL

THELEN, MARRIN, JOHNSON & BRIDGES
ATTORNEYS AT LAW
TWO EMBARCADERO CENTER
SAN FRANCISCO, CA 94111-3995
(415) 392-6320

TELEX 34 0906 CABLE THEMAR
FAX (415) 421-1068

LOS ANGELES
WASHINGTON, D. C.
OAKLAND
ORANGE COUNTY

HONG KONG
NEW YORK
HOUSTON
SAN JOSE

ORIGINAL
FILE

LEE BURDICK*

Direct Dial No.
(415) 955-3548

*Admitted in Maryland and the District of Columbia

May 2, 1991

Donna R. Searcy, Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, D.C. 20554

RE: Advanced Wireless Communications, Inc.
Petition for Rulemaking

Dear Ms. Searcy:

Please find enclosed a Petition for Rulemaking filed on behalf of Advanced Wireless Communications, Inc. The petition seeks amendment of the Commission's rules to authorize the co-primary sharing of air-to-ground channels for the provision of a first-generation Personal Communications Service ("PCS") and the award of a Pioneer's Preference.

If you should have any questions with regard to this matter, please do not hesitate to contact me directly.

Very truly yours,

Lee Burdick

Lee Burdick

Enc.

3031B

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's	)	
Rules to Authorize the Co-Primary	)	
Sharing of Air-to-Ground Channels	)	RM No. _____
For the Provision of First	)	
Generation Personal Communications	)	
Services and the Award of a	)	
Pioneer's Preference	)	

TO: THE COMMISSION

PETITION FOR RULEMAKING
ON BEHALF OF
ADVANCED WIRELESS COMMUNICATIONS, INC.

Ellen S. Deutsch
Lee Burdick
THELEN, MARRIN, JOHNSON & BRIDGES
2 Embarcadero Center
San Francisco, California 94111
(415) 392-6320

May 2, 1991

SUMMARY

Advanced Wireless Communications, Inc. ("AWC") hereby petitions the Commission to initiate a rulemaking to authorize the co-primary use of air-to-ground channels for the provision of first generation Personal Communications Services. The Commission has already recognized that the frequency reuse patterns associated with air-to-ground service allow a number of radio channels to remain fallow at the location of each base station. AWC's initial interference analysis indicates that existing CT-2 technology can be deployed on those unused channels to provide PCS in the near future.

The benefits of AWC's proposal are that it would result in the more efficient use of spectrum in the 800 MHz bands and it would allow for the rapid deployment of available, advanced technologies for use by the American public. Finally, AWC's proposal ensures that the valuable unallocated spectrum below 1 GHz can be assigned to more pressing radio service needs.

As a result of its leadership in the development of this new service, AWC should be awarded a Pioneer's Preference granting it an operating license in the markets where its experimental operations were begun.

TABLE OF CONTENTS

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's	)	
Rules to Authorize the Co-Primary	)	
Sharing of Air-to-Ground Channels	)	RM No. _____
For the Provision of First	)	
Generation Personal Communications	)	
Services and the Award of a	)	
Pioneer's Preference	)	

PETITION FOR RULEMAKING

Advanced Wireless Communications, Inc. ("AWC"),[1/] by its attorneys and pursuant to Commission Rule § 1.401, 47 C.F.R. § 1.401, hereby submits a petition for rulemaking asking the Commission to authorize the co-primary sharing of spectrum in the air-to-ground channels for the provision of a first generation Personal Communications Service ("PCS") and to award a Pioneer's Preference to AWC for the provision of this service once the rulemaking is completed. Specifically, AWC recommends that the Commission authorize co-primary sharing of channels in the 849 to 851 and 894 to 896 MHz range currently authorized for air-to-ground service for the provision of an ancillary service: PCS in selected locations.

In addition, AWC currently holds experimental licenses for the provision of PCS in San Francisco and Cincinnati. For its efforts in the development and provision of this new communications service to the American public, AWC submits

---

1/ AWC plans to develop a nationwide personal communications network.

that the public interest would support the award of a Pioneer's Preference in the markets for which AWC holds experimental licenses. The award of such a preference would serve to encourage the development of a nationwide PCS network and the introduction of other new and innovative radio services.

INTRODUCTION

Beginning in late 1989 and continuing through the present, the Commission has received upwards of 70 applications for experimental authorization to study and develop PCS products and services. The proposals for experimental service reflect a variety of technologies to be operated on a broad range of frequencies between 800 MHz and 2 GHz. In addition, the Commission has two separate proceedings to study the viability of PCS for both voice and data communications. See Amendment of the Commission's Rules to Establish New Personal Communications Services, Gen. Docket 90-314, RM Nos. 7140 and 7175 (Rel. June 28, 1990); see also Petition for Rulemaking for Data-PCS, RM No. _____ (Filed Jan. 28, 1991). The industry response to these proceedings has been broad-ranging, positive and effusive. There should be little doubt at this point that the industry perceives a great demand for PCS products and services.

Unfortunately, many of the proposals before the Commission do not present any reasonable, near-term solutions that can be used to make PCS rapidly available to the general public. The Commission is currently considering several different methods for the provision of PCS which encompass

business applications (e.g., wireless PBX or wireless Centrex service) as well as residential and public access applications (e.g., telepoint). One of the difficulties facing the Commission, of course, is the problem of spectrum allocation. Currently only three megahertz of non-contiguous spectrum are available for allocation below 1 GHz. While this spectrum -- 901 to 902, 930 to 931 and 940 to 941 MHz -- is available and unassigned, it is also the subject of competing applications and could be used to provide both public and private land mobile radio services with much needed spectrum relief.

Moreover, these channels would be of little use to PCS providers in the long run. PCS is likely to require a substantial block of channels, perhaps as much as 100 to 200 MHz. In fact, if the three megahertz were allocated for PCS at this time, it would be too little to effectively allow the first generation of PCS to develop. A minimum of four megahertz is required for CT-2 technology operations and would allow CT-3 equipment to operate at minimum effectiveness. For this reason, a number of parties have begun to speculate on PCS operations above 1 GHz and have requested an allocation for PCS in the range between 1.7 and 2.3 GHz.

However, it is clear that to allocate such a large block of channels for a new service might take anywhere from three to seven years for the allocation to become a reality. In addition, if the Commission were to authorize PCS above 1 GHz, new equipment would have to be developed to operate on those channels. That new equipment would be more expensive to

produce because of the advanced technology necessary for such operations. But more importantly, the development of this new equipment would serve to further delay the availability of PCS to the general public.

Consequently, the Commission is faced with the dilemma of whether to authorize the three MHz of spectrum currently available knowing that it will be insufficient not only in the long run, but also will be less than is needed for optimal operation of existing equipment. These channels would clearly be "too little, too early." The other option is whether to choose the long-term solution by allocating spectrum above 2 GHz. Or perhaps the Commission could do both. If it authorizes PCS use of the 900 MHz bands that are currently available, those channels would be inadequate for the long-term needs of PCS providers. It would be a tragic misuse of spectral resources if those channels were "wasted" or "stranded" when the allocation of a larger block of PCS channels is merely a matter of time. Furthermore, those channels can be put to better use now for cellular, BETRS, paging or other private and public land mobile services.[2/]

2/ The Ameritech Operating Companies agreed with this assessment in their reply comments filed in Gen. Docket 90-314 (January 15, 1991), when they suggested that allocation of existing 900 MHz spectrum for PCS "would be inconsistent with the long term objectives of the evolutionary PCS model. This is simply not sufficient spectrum to support a viable long-term service. . . . These bands would best remain allocated to enhanced General Purpose Mobile Radio Services." Ameritech Reply Comments at 14.

AWC submits that there is a third option available that could speed the provision of PCS to the public and provide valuable information to the Commission on the public demand for PCS. This option would be to use existing CT-2 technology[3/] on a co-primary shared basis in the 800 MHz channels currently authorized to air-to-ground radio service. Technologies already exist that, with minor modification, could be used to provide PCS on these channels. The technologies that are currently available include "CT-2" and "CT-3", both of which can only operate on small blocks of spectrum in the 800 MHz range. Due to the availability of these technologies now, they present a near-term solution to the offering of generally available PCS services. AWC currently has experimental authorizations to test the compatibility of low-powered microcells in the 849 to 851 and 894 to 896 MHz bands and will use the results of these experimental operations to supplement the technical record in this proceeding, which AWC believes will support this novel sharing plan. Attached hereto as Appendix A is AWC's initial technical evaluation of the sharing plan proposed in this petition.

AWC is an Ohio corporation formed in 1990 for the purpose of combining the expertise, technologies and resources of several respected U.S. companies currently involved in

---

3/ By the term "existing CT-2 technology", AWC means to include CT-2 technology, "CT-2 plus" which is due to be released in January of 1992, and "CT-3" technology. Both CT-2 plus and CT-3 accommodate two-way radio transmissions.

telecommunications and personal communications. AWC is dedicated to utilizing the combined expertise of these companies to introduce new and innovative personal communication services to the public. AWC believes that its special business and technical expertise in telecommunications will be necessary to successfully introduce PCS product and services in the U.S.

I. The Commission Should Authorize the Sharing Of Spectrum In the Air-to-Ground Bands for the Provision of Personal Communications Service

In June of 1990, the Commission amended its Table of Frequency Allotments and Part 22 of its rules, 47 C.F.R. Parts 2 and 22, to permit the use of 4 MHz of reserved spectrum for a common carrier air-to-ground radio service. See Allocation of the 849-851/894-896 MHz Bands, Gen Docket 88-96, FCC 90-140 (1990)("ATG Order"). In the Notice of Proposed Rulemaking leading to that decision and in the Report and Order itself, the Commission recognized that "there may be certain frequencies that cannot be used for air-to-ground service in certain geographic areas because, for example, separation criteria for frequency reuse cannot be satisfied. It is conceivable, however, that this spectrum could be put to other uses locally." ATG Order at 39-40. In fact, the Commission concluded that "an air-ground service cannot fully utilize its entire allocation in all geographic areas; therefore, spectrum efficiency can be increased by allowing either the air-ground licensees or others to provide ancillary services so long as

the operations in those services do not interfere with the air-ground service." ATG Order at 41.

The Commission also concluded in the ATG proceeding that:

> because the provision of ancillary services will require extensive coordination . . . we believe that further public notice and comments . . . is warranted. Accordingly, we will not authorize provision of ancillary services at this time. Instead, we will commence a rule making to consider how the provision of ancillary services may be implemented in the air-ground service.

Id. AWC, by this petition, submits that the public interest supports the initiation of a rulemaking proceeding for the provision of ancillary PCS in the air-to-ground channels.

As the Commission noted in the ATG Order, the primary concern governing the ancillary use of air-to-ground channels is the potential for that use to interfere with air-ground service. The key to avoiding such harmful interference would be the proper coordination of local use of those channels for both air-ground and ancillary services. AWC has developed such a coordination plan that it believes presents a reasonable approach to increasing the spectrum efficiency of those channels. One aspect of that plan involves incorporating flexibility in the local use PCS equipment to provide voice and data, or voice or data only as necessary at certain locations. The specifics of the coordination plan are set out in Appendix A. However, the conclusions are summarized here.

A. Interference Analysis.

In its initial interference study, AWC is proposing to use currently existing CT-2 technology developed in the United Kingdom and modified to operate in both the air-to-ground uplink (849 - 851 MHz) and downlink (894 - 896 MHz). AWC submits that with the proper frequency planning, CT-2 operations could begin without interference to air-ground communications. In evaluating this proposal to share the air-to-ground channels, the Commission should consider the potential for interference that might be caused by PCS to air-to-ground services and from air-ground to PCS. AWC submits that the result of such an analysis will show that with certain precautions in place, the two services can peacefully coexist in the same spectrum allocation.

849 to 851 MHz Uplink Band: In its initial interference study regarding the potential for CT-2 to interfere with air-ground communications, AWC assumed that the "worst case" would be where an airplane flies over a city that has implemented CT-2 PCS. If the Commission assumes that air-to-ground Amplitude Companded Side Band ("ACSB") voice communications require an interference-to-carrier ratio of -8.0 dB or less to operate properly, it is clear that CT-2 operations will not significantly interfere with air-ground communications. The result of the interference analysis for this operation shows that the CT-2 to ATG interference-to-carrier ratio is -21.5 dB. Even if an additional 10 dB margin is allowed for fades in the air-ground channel, CT-2 would

still not cause noticeable interference during fading. Moreover, the interference margins can be improved through the use of passive frequency coordination so that air-ground channels used at a particular base station are not the same as those used at a nearby CT-2 base station.

AWC has considered two scenarios in evaluating the interference potential of air-ground to CT-2 in the uplink bands. First, AWC assumed that a -12 dB interference threshold is necessary for CT-2 to operate properly. It then analyzed the potential for interference when the CT-2 base station or user terminal was located 10 miles from the air-ground base station. The second scenario looks to a 100 mile separation between the two base stations or user terminals. When the two base stations -- or the air-ground base station and the CT-2 end user terminals -- are placed approximately 10 miles apart, AWC analysis indicates some potential for the air-ground operations to interfere with CT-2 service. Given the relative power and the path loss for the air-ground transmissions, the predicted interference-to-carrier ratio would be a -13.5 dB, which is less than the CT-2 signal itself and below the threshold for effective CT-2 operation. However, if the Commission were to require an additional margin of 20 dB for the operation of the CT-2 network, the CT-2 operation would be impaired.

While this level of interference may not be acceptable, increased separation between the base stations or end user terminals would greatly improve the interference

protection. For instance, at a separation of 100 miles between the base stations and/or end user terminals, the predicted interference-to-carrier ratio would be -68.5 dB, which is well below the -12 dB threshold required for CT-2 operation. In this case, there is no harmful interference from the air-to-ground base station to the CT-2 network.

894 to 896 MHz Downlink Band: Again, when evaluating the potential for CT-2 operations to interfere with air-ground communications, AWC assumed the worst case with an airplane attempting to communicate with a base station almost 200 miles away in a city that also has an operational CT-2 system. In this situation where the communications are occurring on the air-ground downlink band, the interference-to-carrier ratio would be a -36.0 dB, which is substantially less than the -8.0 threshold requirement. Even if an additional 10 dB margin were required to protect against interference to fading channels, the CT-2 service would still not cause any noticeable interference to the air-ground channel. Furthermore, if the CT-2 station is located farther away (e.g., a 100-mile separation), there would be even less potential for interference.

The potential for interference from air-ground operations to CT-2 stations in the downlink bands is significant. Assuming that the airplane is flying at a six-mile altitude above the CT-2 station, the predicted interference-to-carrier ratio would be +11.0 dB, which is

a result, the CT-2 system would by necessity need to use a different air-ground channel group to avoid disruptive interference to its system.

In summary, it is clear from AWC's initial interference analysis that CT-2 and air-ground radio service can operate in the same channel block on a co-primary basis without significant interference to the other's operations if care is taken in some situations to coordinate the station separations, the environment for voice and/or data applications, and the frequency reuse patterns. The results of AWC's experimental operations will serve to confirm these initial findings and to supplement the technical record in this proceeding.[4/] While this initial analysis supports the allocation of air-ground channels for ancillary use on a co-primary basis, AWC would accept secondary shared use to air-ground service in the alternative.

B. Availability of Technology.

As noted above, one of the primary benefits of AWC's proposal over many others the Commission has before it is that the CT-2 technology is already available and can be readily adapted to this application. Most of the other proposals

---

4/ Ameritech in its Reply Comments noted that as a fundamental approach "the initial use of experimental licenses provides the best foundation for policy development. It is an efficient method which accelerates the availability of new services while providing the technical and economic data upon which to build future and more lasting telecommunications policy." Reply Comments at 2.

before the Commission would require a significant lag time between their adoption, the development of new equipment for the allocated channels, the testing and experimentation of the equipment, and finally bringing the systems on-line.[5/] Moreover, history has shown that the development of new equipment to operate at these higher frequencies will not even begin until the Commission allocates the new channels. On the other hand, CT-2 has already been developed, tested and used in the United Kingdom. Its current availability could speed the provision of PCS to the American public and could result in CT-2 becoming the first generation of PCS in this country.[6/]

Once implemented, CT-2 could potentially serve several million individuals in high-demand, dense markets throughout the U.S., according to several recent reports. For example, one such report written by Economic and Management Consultants International ("EMCI") and published by Phillips Telecommunications Research, a division of Phillips Publishing, Inc. The report noted that consumers would be able to use a CT-2 handset to make an outgoing call from within 200 yards of

---

5/ See Comments of National Semiconductor Corporation, Gen. Docket No. 90-314, RM 7140, RM 7175 at 3 (filed March 16, 1991)("In a newly emerging market such as PCS, it takes approximately 12 months for complex semiconductor [Integrated Circuits] to move from definition stage to production quantities sufficient for equipment manufacturers to conduct full system trials.").

6/ "The 800 - 900 MHz range has the advantage of a preexisting, adaptable technology capable of supporting market entry of CT-2-type services in a matter of months rather than years." Ameritech Reply Comments at 13.

a public access base station. CT-2 could be designed to handle incoming calls, or it can become a part of a two-way communications system when used in conjunction with a pager. In addition, base stations are currently being manufactured for office use as a "wireless PBX" with multiple handsets being able to access multiple telephone lines. The EMCI report noted that "CT-2's strongest competitive position is as an office/telepoint or home/telepoint application. . . . Ten million CT-1 [cordless telephones] were sold in 1989, and there are 25 million PBX lines in the United States. These two markets add millions of additional units to the total market potential for CT-2." With the ready availability of this technology, CT-2 can be rapidly deployed once the Commission acts to authorize frequencies for its use.7/

Therefore, the fundamental policy issue facing the Commission is how to bring "new personal communications services to the public as soon as possible, without prematurely establishing policies which could inadvertently and adversely affect future market development or inefficiently assign spectrum." Ameritech Reply Comments at 2. AWC submits that

---

7/ Moreover, if the Commission authorizes co-primary sharing of CT-2 in the air-to-ground channels, existing technology will allow PCS providers to continue using those channels even when a larger allocation in the 1.7 to 2.3 GHz range comes along. AWC notes that with minimal adjustment to the equipment, a single CT-2 PCS network can accommodate users in both the 800 MHz and the higher bands simultaneously.

once spectrum is authorized for first generation PCS, market forces

> will dictate when and where it is economically feasible to make the incremental investments necessary for PCSs to evolve from CT-2-type services to PCN-type services. CT-2-type services provide an ideal market entry strategy for PCSs, striking an appropriate balance between meeting key customer needs in an emerging market and controlling business risk. Over time, as the PCS market takes shape, competing PCS service providers will continue to evaluate this trade-off as they seek to remain responsive to growing (and changing) customer needs.

Id. at 12. Thus, the best solution to this fundamental policy issue is to authorize the ancillary provision of CT-2 service in the air-to-ground channels and continue to pursue a permanent allocation, most likely in the range above 1.7 to 2 GHz. This solution will result in the prompt delivery of innovative new communications services to the American public while accommodating the long-term spectrum needs of a rapidly growing market.

In addition, PCS through the use of CT-2 technology will provide much needed competition in the form of public alternatives to the wireline switched telephone network and will complement existing paging and cellular telephone services. The EMCI report pointed out that a new cellular market can expect to achieve a three to five percent penetration during the first five-year period. The five-year market potential for the top 100 U.S. markets ranges between 1.3 and 4 million with a mid-point of 2.7 million users. However, if PCS is able to achieve 3.2 percent penetration by

its fifth year, it will generate similar cash flows to cellular . . . ." While the cash flows may be similar for this rather low level of penetration, it is clear from the EMCI report that CT-2 can be built less expensively than cellular on a per subscriber basis, and may prove to be complementary to existing cellular telephone service.

For these reasons, the Commission should allow the use co-primary use of the air-to-ground channels for the provision of PCS. Such an ancillary use of the air-to-ground frequencies will result in greater spectrum efficiencies without the loss of valuable spectrum which has several interested parties vying for its use. Moreover, given the availability of CT-2 technology to be placed in service with only minor modifications, such an authorization could result in the rapid development and availability of PCS to the American public.

C. Feasibility.

The feasibility of PCS operations proposed in this petition are supported by the application of GTE Airfone, the current Commission licensee in the air-to-ground frequencies. Airfone has requested an experimental license to provide PCS as an ancillary service to its air-to-ground operations. In that application filed August 22, 1990, GTE states that it believes ancillary services can be provided without interference to its primary operations (emphasis added). In fact, AWC's interference analysis shows that PCS can be provided on a co-primary basis with air-to-ground service without causing any significant interference if a few simple precautions are taken.

Moreover, if ancillary services are to be provided using the air-to-ground channels, there is absolutely no reason why the provision of those services should be limited to the current air-to-ground licensee. As the Commission noted in the ATG Order, "spectrum efficiency can be increased by allowing either the air-ground licensees or others to provide ancillary services so long as the operations in those services do not interfere with the air-ground service." ATG Order at 41 (emphasis added). The licensing of these services should be on a market-by-market basis, backed up with solid technical analysis resulting from work done under an experimental license without regard to whether the ancillary service is proposed by Airfone or other equally qualified licensees.

II. The Commission Should Grant AWC A Pioneer's Preference for Its Lead In the Authorization of Spectrum for PCS.

On April 9, 1991, the Commission established rules and procedures that will give "preferential treatment in its licensing processes to parties requesting spectrum allocation rule changes associated with the development of new communications services and technologies." News Release, Report No. DC-, Gen. Docket 90-217 (April 9, 1991). The so-called "Pioneer's Preference" is designed to ensure that "innovators have an opportunity to participate either in new services that they take the lead in developing or in existing services to which they wish to apply new technologies." Id. While not enough time has passed since its adoption for an order to issue on the Pioneer's Preference, the news release

noted that a "preference will be awarded to an entity that demonstrates that it . . . has developed an innovative proposal that leads to the establishment of an existing service not currently provided or a substantial enhancement of an existing service." Id.

AWC submits that if the Commission acts favorably on the instant petition and issues a report and order authorizing the co-primary, or in the alternative secondary, shared use of the air-to-ground channels for the provision of PCS, AWC should receive a Pioneer's Preference for its leadership in establishing this new service. The fact that AWC is proposing an innovative plan for sharing the air-to-ground channels, rather than proposing an entirely new allocation, should not preclude it from receiving the preference. In fact, in its news release announcing the adoption of the preference, the Commission noted that "[p]roposals that would enable the sharing, or co-use, of allocated spectrum will be given careful consideration." In this case, as AWC's proposal would result in greater spectral efficiency through sharing, the public interest would support a grant of a Pioneer's Preference to AWC.

If the Commission awards a preference in this case, AWC suggests that it should be awarded guaranteed licenses in the cities in which its experimental operations were begun. The award of such a Pioneer's Preference would serve to encourage the development of a nationwide PCS network.

CONCLUSION

Advanced Wireless Communications hereby requests that the Commission initiate a rulemaking proceeding to authorize the co-primary use of air-to-ground channels for the provision of Personal Communications Services. The benefits of AWC's proposal are that it would result in the more efficient use of spectrum in the 800 MHz bands and it would allow for the rapid deployment of available, advanced technologies for use by the American public. Finally, AWC's proposal ensures that the valuable spectrum that remains available below 1 GHz can be assigned to more pressing radio service needs. As a result of its leadership in the development of this new service, AWC deserves an award of a Pioneer's Preference granting it an operating license in the two markets where its experimental operations were begun.

Respectfully submitted,

ADVANCED WIRELESS
COMMUNICATIONS, INC.

By 
Ellen S. Deutsch
Lee Burdick

Its Attorneys

THELEN, MARRIN, JOHNSON & BRIDGES
2 Embarcadero Center
San Francisco, California 94111

(415) 392-6320

May 2, 1991

TMJB A:2996B

Appendix A

Air-to-Ground/CT-2
CO-PRIMARY OPERATION ANALYSIS

Advanced Wireless Communications, Inc. ("AWC") proposes CT-2 testing with GPT equipment modified to operate in the frequency bands, 849 to 851 MHz (Air-to-Ground uplink) and 894 to 896 MHz (Air-to-Ground downlink). It is shown below that, with appropriate frequency planning, CT-2 operations may occur without interference into the current air-to-ground Amplitude Companded Side Band ("ACSB") voice communications.

1.0 ASSUMPTIONS

A. Air-to-Ground System

i. The current air-to-ground system licensed to and operated by GTE Airfone uses a frequency plan that is based upon grouping 31 ACSB voice channels and one pilot channel into a 200 kHz multiplexed channel group. Each channel is spaced 6 kHz apart and transmit ERP is limited to 30 Watts or less for the airborne mobile and 100 Watts or less for the base station..

ii. The uplink frequencies are in the 849-851 MHz band starting with a pilot at 849.010 MHz and voice channels at 849.016 to 849.196 MHz repeating every 200 kHz to 850.996 MHz. The downlink frequencies are offset 45 MHz to lie between 894.010 to 895.996 MHz.

iii. The frequency reuse plan allocates the 200 kHz channel groups to a base station such that the ten channel groups form a reuse plan that prevents a frequency from being reused within 300 miles of a base station.

iv. Radio propagation is subject to free-space loss (20 dB/decade) and fading margins are less than observed in the ground/ground mobile environment. Fading margin of 10 dB is assumed.

v. The Airfone system is used in air/ground voice communications up to 200 miles distant from the base station with aircraft at 6 mile altitude.

vi. The Airfone base station is 200 m above average terrain height.

vii. The interference-to-carrier (I/C) ratio required for ACSB with pilot, servo-controlled gain is -8.0 dB or less.

B. CT-2 GPT System

i. The modified CT-2 system operates in either the 849-851 MHz and 894-896 MHz bands. Each channel is spaced 100 kHz apart and transmit ERP is limited to 100 milliwatts. A base station antenna pattern is used which reduces gain to -10 dBi or less at 45 degrees elevation and higher.

ii. Path loss is assumed to be 40 dB/decade with fade margins of 20 dB.

iii. The outbound and inbound channels from base-to-remote and return are on the same frequency and operate half-duplex.

iv. The CT-2 system is used for ground-ground communications in microcells of 500 meter radius or less.

v. The CT-2 experimental system is installed such that the nearest Airfone Base Station is at least 10 miles away. The CT-2 base station is at 10 m elevation.

vi. The CT-2 interference-to-carrier (I/C) ratio required is -12 dB or less.

C. Frequency Coordination

i. AWC is currently authorized to begin experimental testing of CT-2 operations on the air-to-ground channels in San Francisco, California and Cincinnati, Ohio.

ii. The nearest Airfone base station to the San Francisco Bay Area is located in Oakland, California which makes it a part of the Bay Area. The Airfone base station operates on an uplink frequency group 850.810 to 850.996 MHz which places it at the upper edge of the 849-851 MHz band. The next nearest co-band Airfone base stations are: 1) Klamath Falls, Oregon, (about 360 miles distant operating 850.210 to 850.396 MHz); and 2) Visalia, California, (about 200 miles distant transmitting 849.610 to 849.796 MHz).

iii. The nearest co-band Airfone base stations to Cincinnati, Ohio are: 1) Fairdale (Louisville), Kentucky (about 100 miles distant transmitting on 849.810 to 849.996 MHz); 2) Ft. Wayne, Indiana, (about 120 miles distant transmitting on 849.610 to 849.796 MHz); 3) Nashville, Tennessee, (about 220 miles distant transmitting on 850.410 to 850.596 MHz); 4) Schiller Park (Chicago), Illinois, (about 220 miles distant transmitting on 850.610 to 850.796 MHz); and 5) Coropolis (Pittsburgh), Pennsylvania, (about 230 miles distant transmitting on 850.210 to 850.396 MHz).

iv. Each Airfone base station is limited to one 200 kHz bandwidth channel group of 6 kHz ACSB voice channels plus one pilot channel. This leaves 180 MHz of spectrum in each region around that base station that could be frequency coordinated with the next nearest Airfone base stations to prevent co-frequency operation with any of the Airfone base stations and mobiles within radio horizon distance.

2.0 INTERFERENCE ASSESSMENT

Use of the 849-851 MHz Frequencies (Uplink Band)

Interference of CT-2 into Airfone Mobile Transceivers: Here AWC assumes that the worst scenario for the airplane is flying over a city that implemented an experimental CT-2 system. The city is about 200 miles distant from the next closest Airfone base station. This is similar to a CT-2 implementation in Cincinnati, Ohio which is 100 to 230 miles from the closest Airfone base station in this band.

The aircraft is at 6 miles closest range to the CT-2 system which has a -10 dBi base station antenna gain or less above 45 degree elevation. The CT-2 signal level received at the Airfone-equipped airplane would additionally be reduced by 10 dB, the CT-2's antenna discrimination. Thus the relative "path loss plus CT-2 antenna gain" is 20.5 dB. The relative bandwidth occupied by the CT-2 transmission compared with the Airfone channel is 100 kHz to 6 kHz or a factor of 16.7 (12 dB). Assuming uniform power density, the CT-2 interference power is reduced by 12 dB in the Airfone 6 kHz voice channel. The total interference protection is thus 20.5 minus 12 equals 8.5 dB. That is given equal ERPs, the CT-2 signal in the 6 kHz